ACUTE TOXICITY SUMMARY

BENZYL CHLORIDE

*(*a*-chlorotoluene, chloromethylbenzene, tolyl chloride)*

CAS Registry Number: 100-44-7

I. Acute Toxicity Summary (for a 1-hour exposure)

Inhalation reference exposure level	**240 µg/m³**
Critical effect(s)	eye and nose irritation in rats and mice
Hazard Index target(s)	Eyes; Respiratory System

II. Physical and Chemical Properties (HSDB, 1994 except as noted)

Description	colorless to slightly yellow liquid
Molecular formula	C_7H_7Cl
Molecular weight	126.58
Density	1.1 g/cm^3 @ 20°C
Boiling point	179° C
Melting point	-43 to -48°C
Vapor pressure	1 mm Hg @ 22°C
Flashpoint	67°C, closed cup; 74°C, open cup
Explosive limits	upper = unknown lower = 1.1% by volume in air
Solubility	insoluble in water; miscible with most organic solvents
Odor threshold	0.041 ppm (240 µg/m³) (geometric mean) (AIHA, 1989)
Odor description	pungent (AIHA, 1989)
Metabolites	benzyl mercapturic acid, benzoic acid
Conversion factor	1 ppm = 5.2 mg/m³ @ 25°C

III. Major Uses or Sources

Benzyl chloride is a chemical intermediate in the manufacture of dyes, plasticizers, lubricants, gasoline additives, pharmaceuticals, tanning agents, and quaternary ammonium compounds (HSDB, 1994). Benzyl chloride can react with water or steam to produce corrosive and toxic fumes. It reacts vigorously with oxidizing materials, decomposes rapidly, and liberates heat and hydrochloric acid when exposed to all common metals, except lead and nickel. When heated, it may form phosgene (Hazardtext, 1993).

IV. Acute Toxicity to Humans

Benzyl chloride is extremely irritating to the eyes, nose, and throat, is a potent lacrimator, and is capable of causing pulmonary edema (Smyth, 1956). Exposure to 31 ppm (160 mg/m³) benzyl chloride for 5 minutes was reported to be unbearably irritating to the eyes and respiratory tract; a 5-minute exposure to 1.2-1.5 ppm (6-8 mg/m³) benzyl chloride resulted in "slight conjunctivitis" (Mikhailova, 1983). Skin burns or irritation may result from direct contact with vapors or liquid (Meditext, 1993).

Human volunteers exposed to benzyl chloride vapor for a single breath reported that the odor was perceptible at 8 ppm (42 mg/m³), very unpleasant at 17 ppm (88 mg/m³), painfully strong at 37 ppm (190 mg/m³), and intolerable at 79 ppm (410 mg/m³) (Katz and Talbert, 1930).

Occupational exposure to 2 ppm (10 mg/m³) benzyl chloride was reported to result in neurological symptoms and liver dysfunction; these effects most likely reflect chronic exposure, although the duration of exposure was not reported (Mikhailova, 1983). Little or no information was reported on the number of workers examined in the original studies cited, on the range of exposure, or on possible concomitant exposures.

Predisposing Conditions for Benzyl Chloride Toxicity

Medical: Those individuals with preexisting eye, skin, allergic, liver or kidney disease or preexisting respiratory conditions including underlying cardiopulmonary disease may be more sensitive to the effects of benzyl chloride exposure (Reprotext, 1999).

Chemical: Persons exposed to other irritants might be more sensitive (Reprotext, 1999).

V. Acute Toxicity to Laboratory Animals

The 2-hour LC_{50} for benzyl chloride is reported as 0.39 mg/l (80 ppm) and 0.74 mg/l (150 ppm) in mice and rats, respectively (Mikhailova, 1965). The same study reports that rats and mice exposed to concentrations exceeding 0.1 mg/l (20 ppm) benzyl chloride for 2 hours exhibited irritation of the eyes, nose, and throat and decreased respiratory rate. Two cats exposed for 8 hours per day for 6 days to 95 ppm (500 mg/m³) benzyl chloride exhibited eye and respiratory irritation and decreased appetite (Wolf, 1912).

VI. Reproductive or Developmental Toxicity

No adverse reproductive effects were observed in rats administered 50 or 100 mg/kg/day benzyl chloride orally on days 6-15 of gestation (Skowronski and Abdel-Rahman, 1986). A non-statistically significant increase in sternebral defects was observed in the 100 mg/kg/day exposure group. No maternal toxicity was observed.

VII. Derivation of Acute Reference Exposure Level and Other Severity Levels (for a 1-hour exposure)

Reference Exposure Level (protective against mild adverse effects): 46 ppb (240 μg/m³)

Study	Mikhailova, 1965
Study population	rats and mice
Exposure method	inhalation chamber
Critical effects	signs of irritation of eyes and nasal passages; decreased respiratory rate
LOAEL	20 ppm
NOAEL	not observed
Exposure duration	2 hours
Extrapolated 1 hr concentration	28 ppm (20^2 * 2 h = C^2 * 1 h) (see Table 12 for information on "n")
LOAEL uncertainty factor	6
Interspecies uncertainty factor	10
Intraspecies uncertainty factor	10
Cumulative uncertainty factor	600
Reference exposure level	46 ppb (240 μg/m³)

An animal study was used for the derivation of the REL because the available human data (Smyth, 1956; Mikhailova, 1983; Katz and Talbert, 1930) were not adequate for the determination of this level; the original human data were anecdotal and the exposure conditions were not well defined.

Level Protective Against Severe Adverse Effects

No recommendation is made due to the limitations of the database.

Level Protective Against Life-threatening Effects

No recommendation is made due to the limitations of the database.

NIOSH lists an IDLH of 10 ppm. However, NIOSH admits: "Very little data are available on the acute effects of exposure to benzyl chloride." NIOSH also states: "ACGIH (1971) reported that in 1 minute an exposure to 16 ppm is intolerable to man (Flury and Zernik, 1931). ILO (1972) reported that 20 ppm will render the atmosphere irrespirable in 1 minute. ILO (1971) reported that 50 to 100 mg/m³ (10 to 19 ppm) immediately causes weeping and twitching of the eyelids, while 160 mg/m³ (30 ppm) causes effects that are intolerable to the eyes and nasal mucous membranes. Based on this data, an IDLH of 10 ppm is assumed in order to avoid difficulties in escape in the event of respirator failure." The level makes no allowance for sensitive individuals and therefore can not be recommended for use for the general public.

VIII. References

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Mikhailova TV. Benzyl chloride. In: International Laboure Office Encyclopaedia of Occupational Health and Safety. 3rd ed. Vol. 1. Geneva: ILO; 1983. p. 262. (The author's name is incorrectly spelled in this reference as "Mihajlova". The correct spelling is that which appears above.)

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